MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2022/2023

EEE 7286 – ENERGY MANAGEMENT IN INDUSTRY

4 OCTOBER 2023
9:00 AM – 12:00 PM
(3 Hours)

INSTRUCTIONS TO STUDENTS

1. This Question paper consists of 4 pages including cover page with 4 Questions only.
2. Answer ALL questions. The distributions of the marks for each question are as stated.
3. Please print all your answers in the Answer Booklet provided.

Question 1

(a) Differentiate "energy" and "power". Then explain why as Energy Manager, we manage energy but not power.

[10 Marks]

(b) Differentiate the concept of energy conservation and energy efficiency.

[6 Marks]

(c) Explain the basic principle of energy management. Then, state THREE objectives of energy management.

[5 Marks]

(d) Draw the generic organizational structure to implement an Energy Management Programme.

[4 Marks]

Continued...

Question 2

(a) A power plant has just invested $100,000 to purchase a set of equipment for its operational needs. The expected useful life of the equipment is 10 years with salvage value of 6% of its capital cost. Assume that the annual compounded interest is 6%. Compute the amount of money to be deposited on an annual basis for replacement by:

(i) Straight line method
(ii) Sinking fund method
(iii) Sum of the years' digit method

[13 marks]

(b) Explain FOUR principles which Tenaga Nasional (utility company of Peninsular Malaysia) needs to follow when setting the tariff. [8 marks]

(c) A factory is operating 20 hours a day for the whole year of 2022 except for the month of November. The average load was 300 kW and maximum demand of 350 kW at 0.85 power factor. Compute the total energy cost for 2022 based on the following tariff:

$0.10 per kWh
$7.50 per month per kVA of maximum demand

[4 marks]

Continued...

Question 3

(a) Estimate the number of lamps required to obtain the minimum illuminance of 200 lx for a room measuring 30 m (length) × 10 m (width) × 5 m (height). Assume that the maintenance factor is 0.7 and the coefficient of utilization is 0.6. Each LED lamp is rated at 25W, 2000 lm. Then, calculate the efficacy of the lamp. Finally, explain THREE ways to improve energy usage by the lamps. [12 Marks]

(b) Discuss THREE ways that a factory can save energy needed to run the motors. [6 Marks]

(c) Explain why "building envelope" is important for an Energy Manager. Then, explain TWO ways to improve thermal energy efficiency of a building which involves considering "building envelope". [7 marks]

Question 4

(a) Explain what do you understand about *captive power plant.* Then, discuss under what situation, a *captive power plant* would be beneficial to an industry. [7 Marks]

(b) For a textile manufacturing plant, evaluate which is a better option as a *captive power plant*, a *steam power plant* or a *gas turbine power plant.* Provide THREE reasons. [6 Marks]

(c) A generating station (set) in which diesel engine is used as the prime mover for the generation of electrical energy is known *as diesel power station (set).* List down THREE advantages and disadvantages of *diesel power station.* [6 Marks]

(d) Compute the overall plant efficiency where $\eta_1 = 0.6$ and $\eta_2 = 0.4$ if:

(i) Both cycle of a given plant is working in series
(ii) The plant only has one cycle (η_1)
(iii) Compare (i) and (ii)

[6 Marks]

End of Paper